4W AUDIO AMPLIFIER WITH DC VOLUME CONTROL — TDA1013A

The TDA1013A is a monolithic integrated audio amplifier circuit with d.c. volume control in a 9-lead single in-line (SIL) plastic package. The wide supply voltage range makes this circuit very suitable for applications in mains-fed apparatus such as television receivers and record players.

The d.c. volume control stage has a logarithmic control characteristic with a range of more than 80 dB; control can be obtained by means of a variable d.c. voltage between 3.5 and 8 V.

The audio amplifier has a well defined open loop gain and a fixed integrated closed loop gain. This offers an optimum in number of external components, performance and stability.

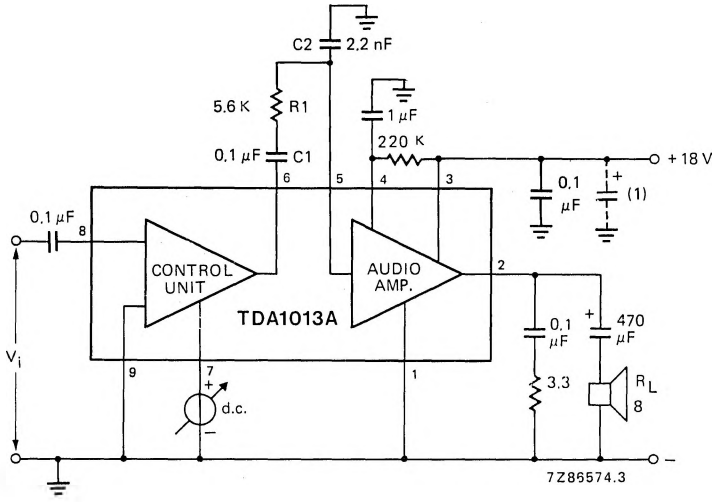
The SIL package (SOT-110B) offers a simple and low-cost heatsink connection.

QUICK REFERENCE DATA

Supply voltage range	V_P		15 to 35 V
Repetitive peak output current	I_{ORM}	max.	1.5 A
Total sensitivity (d.c. control at max. gain) for P_o = 2.5 W	V_i	typ.	55 mV
Audio amplifier			
Output power at d_{tot} = 10% V_P = 18 V; R_L = 8 Ω	P_o	typ.	4.5 W
Total harmonic distortion at P_o = 2.5 W; R_L = 8 Ω	d_{tot}	typ.	0.5 %
Sensitivity for P_o = 2.5 W	V_i	typ.	125 mV
D.C. volume control unit			
Gain control range	ϕ	>	80 dB
Signal handling at d_{tot} < 1% (d.c. control at 0 dB)	V_i	>	1.2 V
Sensitivity for V_o = 125 mV at max. voltage gain	V_i	typ.	55 mV
Input impedance (pin 8)	$\|Z_i\|$	typ.	250 kΩ

PACKAGE OUTLINE

9-lead SIL; plastic (SOT-110B).



(1) Belongs to power supply.

Fig. 1 Basic application diagram also used as test circuit with R1 = 5.1 kΩ and C1 = 22 nF.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Supply voltage	V_P	max.	35 V
Non-repetitive peak output current	I_{OSM}	max.	3 A
Repetitive peak output current	I_{ORM}	max.	1.5 A
Storage temperature	T_{stg}		−55 to + 150 °C
Crystal temperature	T_j		−25 to + 150 °C
Total power dissipation	see derating curve Fig. 2		

HEATSINK DESIGN

Assume V_P = 18 V; R_L = 8 Ω; T_{amb} = 60 °C (max.); T_j = 150 °C (max); for a 4 W application into an 8 Ω load, the maximum dissipation is about 2.5 W.
The thermal resistance from junction to ambient can be expressed as:

$$R_{th\ j\text{-}a} = R_{th\ j\text{-}tab} + R_{th\ tab\text{-}h} + R_{th\ h\text{-}a} = \frac{T_{j\ max} - T_{amb\ max}}{P_{max}} = \frac{150 - 60}{2.5} = 36\ K/W.$$

Since $R_{th\ j\text{-}tab}$ = 9 K/W and $R_{th\ tab\text{-}h}$ = 1 K/W, $R_{th\ h\text{-}a}$ = 36 − (9 + 1) = 26 K/W.

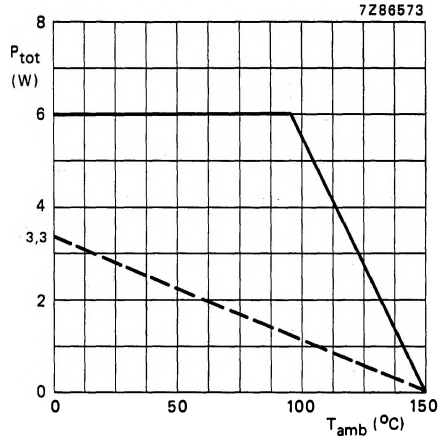


Fig. 2 Power derating curve.
——— infinite heatsink;
– – – without heatsink.

CHARACTERISTICS

V_P = 18 V; R_L = 8 Ω; f = 1 kHz; T_{amb} = 25 °C; unless otherwise specified

Supply voltage	V_P	typ.	18	V
			15 to 35	V
Total quiescent current	I_{tot}	typ.	35	mA
Noise output voltage (see also note)	V_n	<	1.4	mV
Total sensitivity (d.c. control at maximum gain) for P_o = 2.5 W	V_i		38 to 69	mV
		typ.	55	mV
Frequency response (–3 dB)	f		35 Hz to 20	kHz
Audio amplifier				
Repetitive peak output current	I_{ORM}	<	1.5	A
Output power at d_{tot} = 10%	P_o	>	4	W
		typ.	4.5	W
Total harmonic distortion at P_o = 2.5 W	d_{tot}	typ.	0.5	%
		<	1	%
Voltage gain	G_v	typ.	30	dB
Sensitivity for P_o = 2.5 W	V_i	typ.	125	mV
Input impedance (pin 5)	$\|Z_i\|$	>	100	kΩ
		typ.	250	kΩ

Note

Measured in a bandwidth according to IEC 179-curve 'A'; R_S = 5 kΩ and d.c. control at minimum gain.

CHARACTERISTICS (continued)

D.C. volume control unit

Gain control range (see also Fig. 3)	ϕ	>	80 dB
Signal handling at $d_{tot} < 1\%$ (d.c. control at 0 dB)	V_i	>	1.2 V
Sensitivity for V_o = 125 mV at max. voltage gain	V_i	typ.	55 mV
Input impedance (pin 8)	$\|Z_i\|$	>	100 kΩ
		typ.	250 kΩ
Output impedance (pin 6)	$\|Z_o\|$	100 to	400 Ω
		typ.	200 Ω

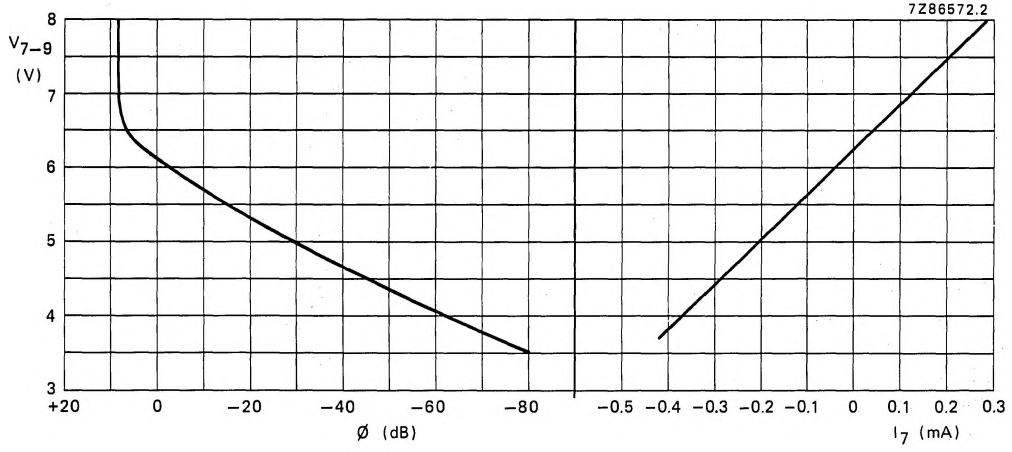


Fig. 3 Typical values gain control; V_i at pin 7.